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INT CL⁴ B29C, B29D, E04G

(54) **Method of constructing a scaffold plank**

(57) The method comprises:

forming in a mould (26) an elongated first layer of uncured resin impregnated glass fibre (30) of a length and width corresponding to that of the finished plank,

placing a preformed stiffening member or members (20) in the mould extending substantially the length of the first layer and upstanding therefrom, the of each stiffening member being in intimate contact with the first layer at least at a plurality of spaced locations along the length thereof,

forming an elongated second layer (32) of uncured resin impregnated glass fibre of a length and width corresponding to that of the finished plank in intimate contact with the stiffening member or members at least at a plurality of spaced locations along the length thereof, said second layer being in opposed relation with respect to said stiffening memb r to the first layer, and

allowing the resin in the first and second layers to cure to form the first and second layer and the stiffening member or members into an integral structure.

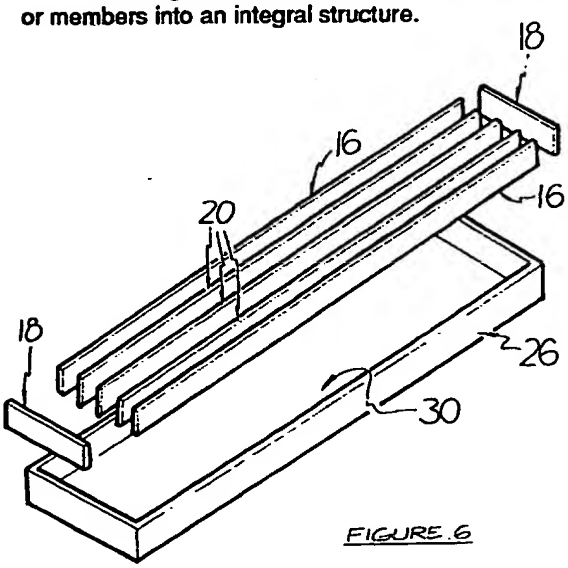

FIGURE 6

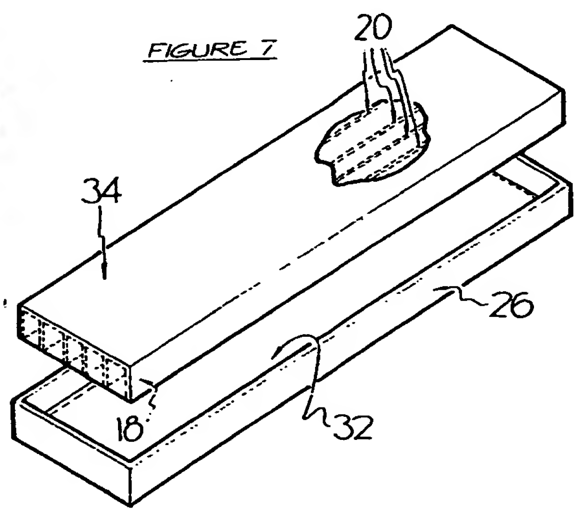

FIGURE 7

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FIGURE.1

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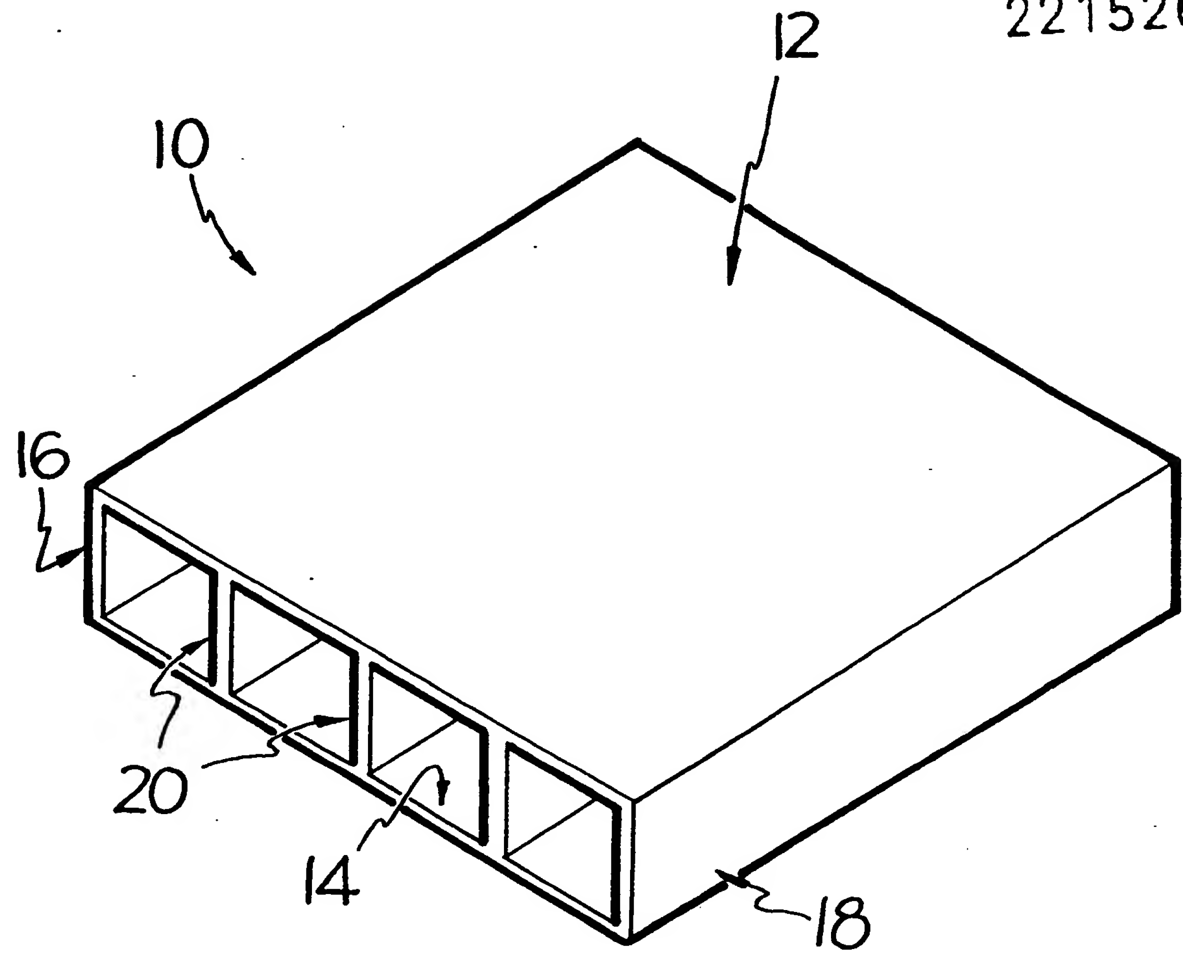


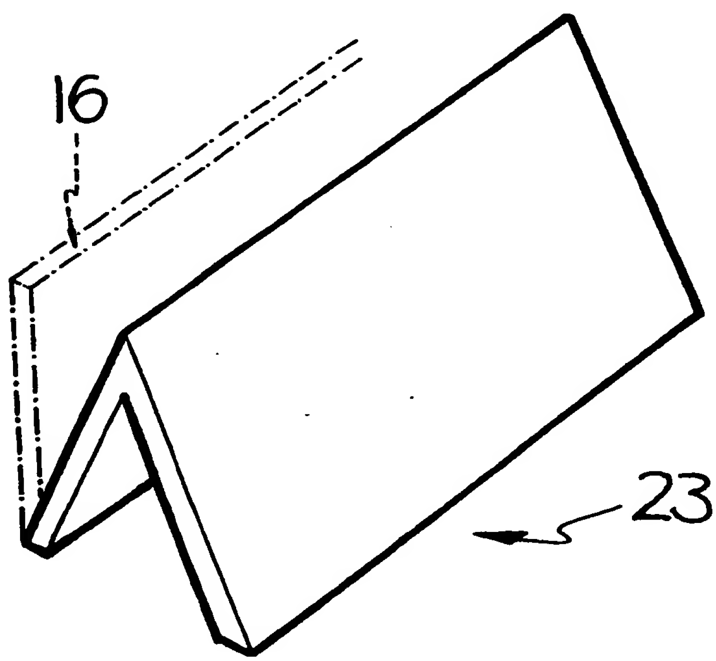
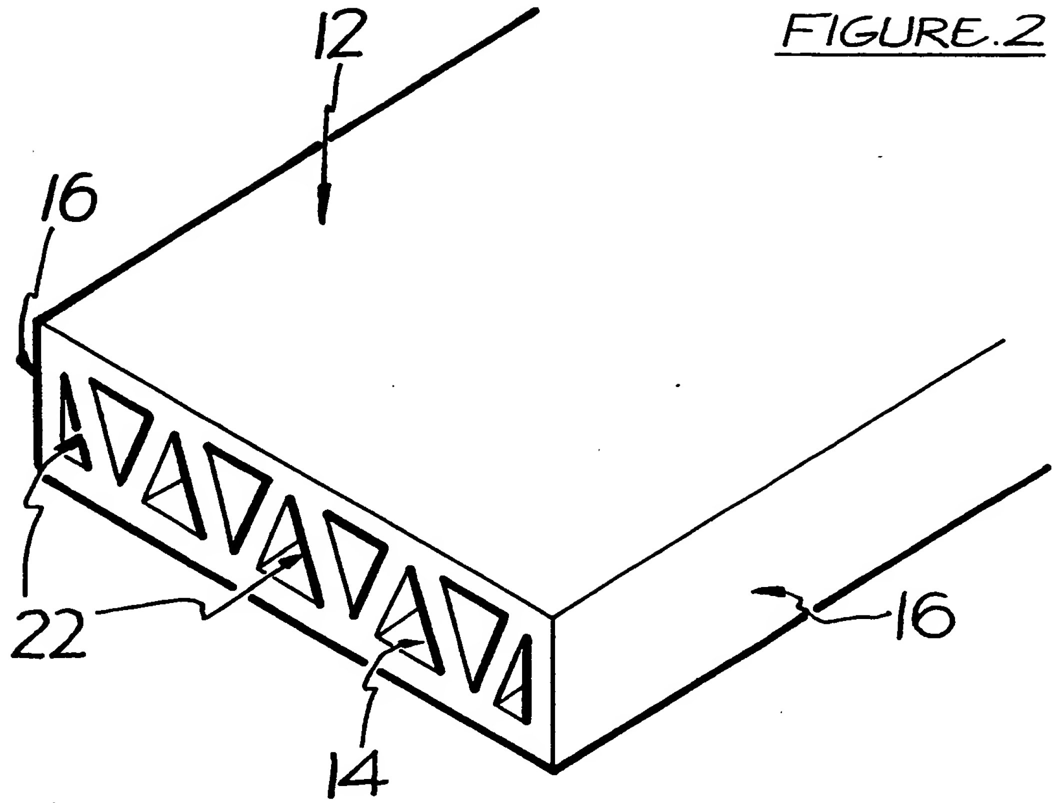


FIGURE.4

FIGURE.2



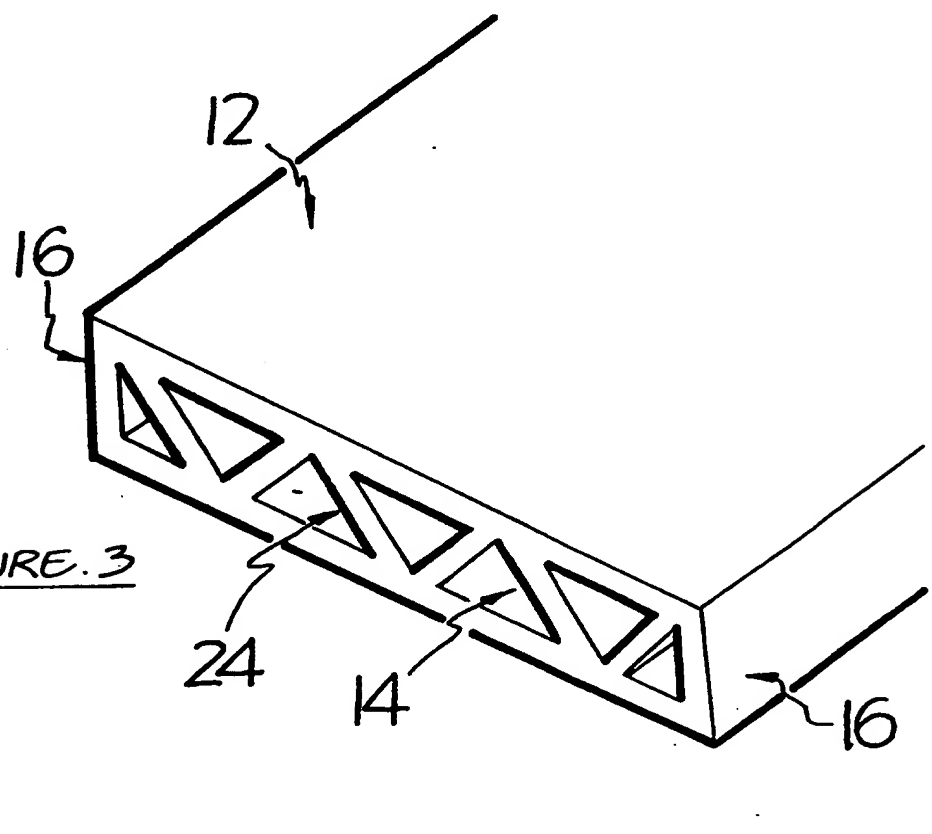


FIGURE.3

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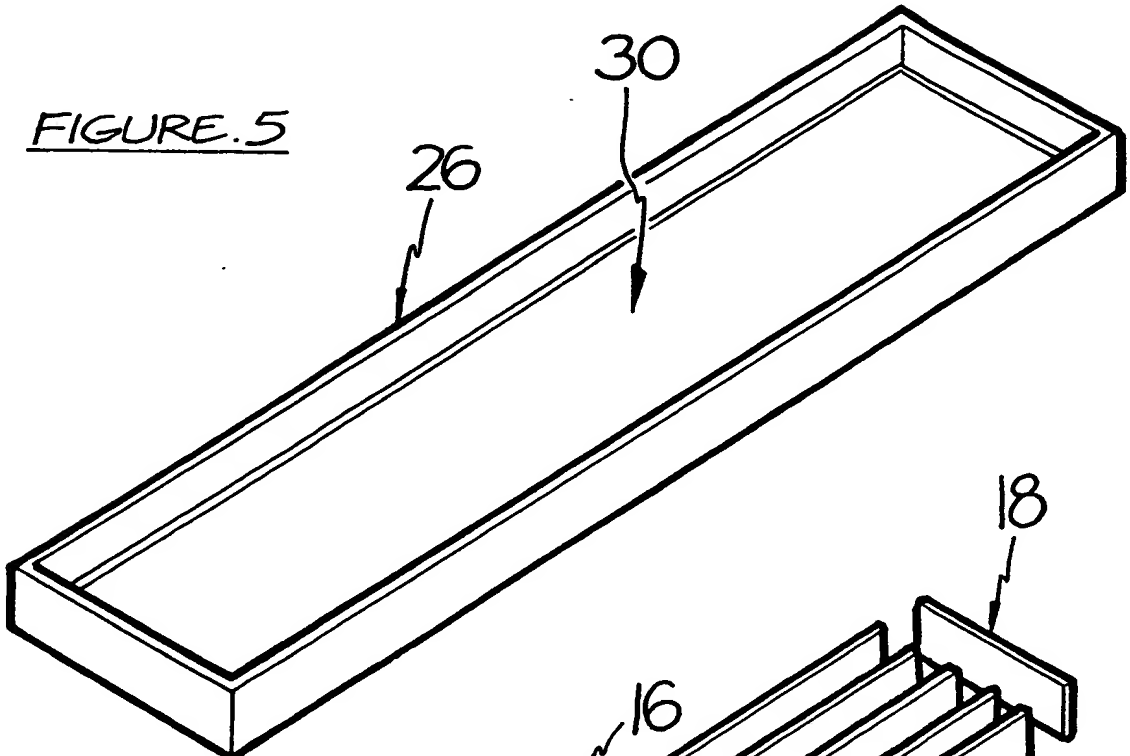
FIGURE.5



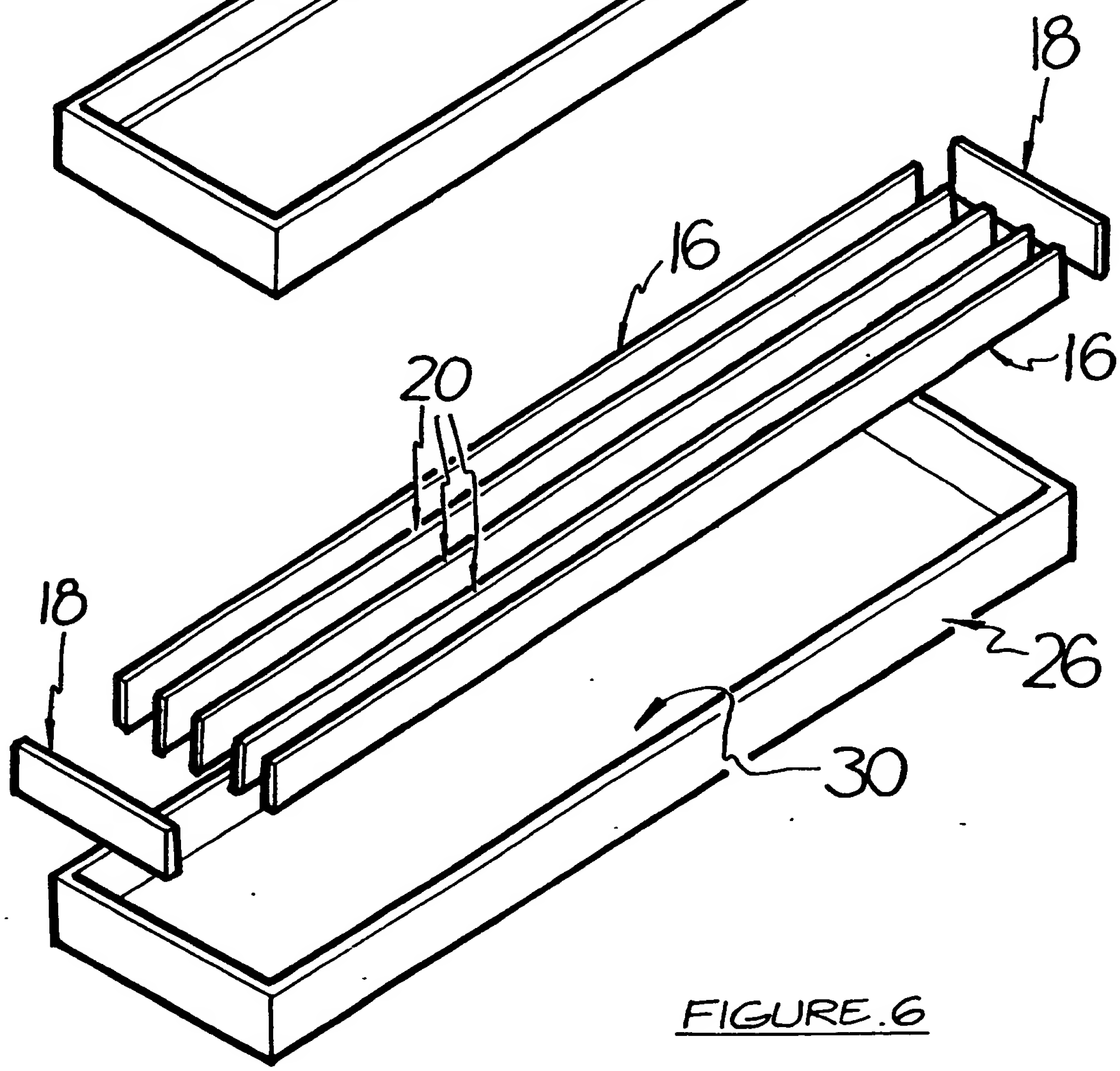
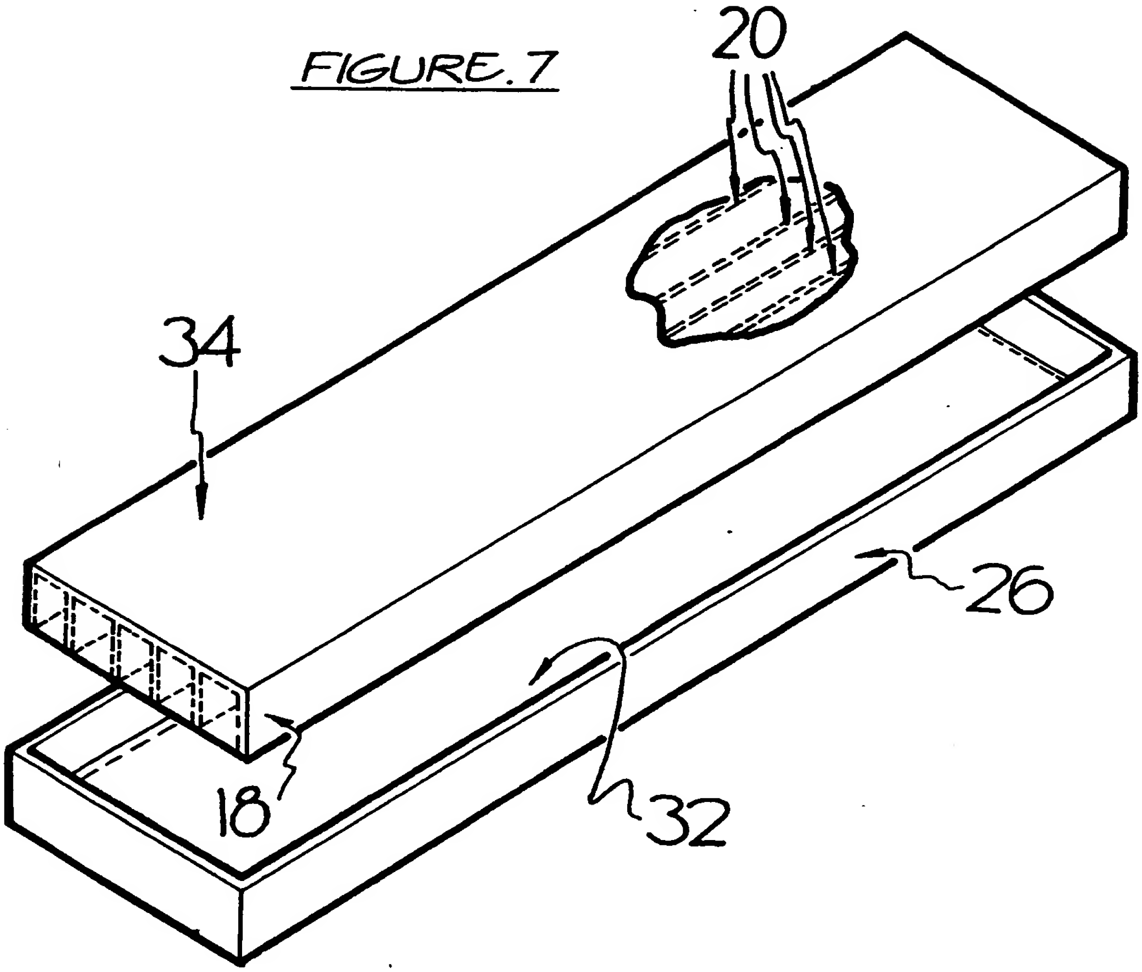


FIGURE.6

FIGURE. 7



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SCAFFOLD PLANK

This invention relates to a scaffold plank as used extensively to establish walkways and work platforms in scaffold structures used on construction sites. Scaffolding and scaffold planks are widely used in the construction industry, both in relation to the construction of buildings and the erection of a variety of structures extending a substantial height above the ground. Scaffolding is of course also used in regard to maintenance of such buildings and structures and also in the dismantling or wrecking thereof.

In most uses of scaffolding, safety standards ar laid down by appropriate regulating authorities, both in regard to the nature and manner of erection of the scaffolding, and in regard to the strength and condition of the various components, including scaffold planks. In view of the adverse environmental and use conditions in which scaffolding and scaffold planks are commonly used, they are frequently subject to accidental misuse and mishandling that may cause damage thereto that reduces the physical strength of the scaffold components, such as scaffold planks. Accordingly, the useful life of such components may be relatively short, and hence the level of wastage and the cost of replacement is relatively high.

In regard to scaffold planks in particular, they are normally used in the manner of a beam supported at spaced locations and accordingly any damage to a scaffold plank which impairs its mechanical strength is considered unsafe, and thus such damaged scaffold planks must be discarded. A large proportion of scaffold planks are made f timber, usually f Or gon r simil r lightweight high strength timb r. Alth ugh timber planks can withstand c nsiderable misuse with ut a significant imp irment f their strength, they are prone to splitting in the l ngitudinal direction, particularly after they have been exp s d t utdo r weather c nditi ns for a considerable

period. Longitudinal splitting of wooden planks is not conveniently repairable to a standard that retains the required strength, and accordingly, safety regulations normally require the discarding of scaffold planks once significant longitudinal splitting has occurred.

Metal planks have also been used, which do not suffer from the problem of longitudinal splitting, but because of the non solid nature thereof, comparatively minor bending or deformation of sections of the plank can severely impair the mechanical strength thereof. In regard to steel planks, it is necessary, because of the high density of steel, for the plank to be manufactured from a relatively thin gauge metal strip or plate, which is formed with appropriate flanges or ribs to create the required strength. However, any bending or deformation of the flanges or ribs severely reduce the mechanical strength of the plank and it is difficult to effect repairs which will return the plank to its original design strength. Metal planks have also been made from extruded aluminium sections, or plain fabricated aluminium strip, which although much lighter than steel, is of significantly less mechanical strength and higher cost per unit weight. The use of aluminium does reduce the weight of the plank, which is a major disadvantage of steel planks, however aluminium is generally more easily bent and distorted than steel, such as may arise from dropping or mishandling of the plank, and would therefore suffer more damage from that mishandling. Generally, it is a requirement of safety regulations that once a metal plank has been significantly bent or distorted in use, it cannot be merely straightened and reused, but must b considered unservicable.

Furth r, it has been pr p sed t impr ve the weather and split resistence of timber planks by encasing them in a fibr glass r inf rced r sin sheath. Although this d es substantially increase the normal lif f the pl nk, the dditi n f th fibr glass r sin sheath substantially

increases the total weight of the plank and thus makes them more difficult to handle, particularly in view of the substantial amount of manual handling required in the normal erection and dismantling of scaffolding.

It is therefore the principal object of the present invention to provide a scaffold plank that is of sufficient strength to carry the loads encountered in use, is resistent to deterioration due to exposure to weather, is substantially non-ductile so as to not be easily bent or deformed due to mistreatment, and is of a weight that can b readily manually handled in a manner similar to wooden planks.

In accordance with one aspect of the present invention, there is provided a method of constructing a scaffold plank comprising:

(a) forming in a mould an elongated first layer of uncured resin impregnated glass fibre of a length and width corresponding to that of the finished plank,

(b) placing a preformed stiffening member or members in the mould extending substantially the length of the first layer and upstanding therefrom, the or each stiffening member being in intimate contact with the first layer at least at a plurality of spaced locations along the length thereof,

(c) forming an elongated second layer of uncured resin impregnated glass fibre of a length and width corresponding to that of the finished plank in intimate contact with the stiffening member or members at least at a plurality of spaced locations along the length thereof, said second layer being in opposed relation with respect to said stiffening member t the first layer, and

(d) all wing th resin in the first and second layers to cure to f rm th first and second layer and the stiffening member r members int an integr l structure.

C nveniently at least ne of the stiffening members is f a "V" shaped cr ss-s cti n and is positioned in the

mould in an inverted disposition with the ends of the arms of the "v" in initmate contact with the first layer. Preferably two pre-formed side wall members are positioned in the mould between the forming of the first and the second layer therein. the side wall members being located to form respectively the opposite longitudinal sides of the finished plank, and are in intimate contact with the first and second layers to be bonded thereto during the curing of the layers.

Only one stiffening may be used being in the form of a corrugated sheet with the corrugation extending in the longitudinal direction of the plank. The crest of the corrugations on opposite sides of the sheet being in intimate contact with the first and second layers respectively during curings of the latter.

The scaffold plank constructed as above described is of particular light weight and high strength. The manner of manufacture enables the incorporation of the internal stiffening members to provide the required strength when the plank is used in the manner of a beam whilst the outside skin of the blank is quite thin. In addition, the rigid nature of the fibreglass reinforced resin resists deformation and bending of the plank or components thereof which in metal planks substantially reduces the structural strength of the plank. It is also to be appreciated that fibreglass resin components can be very effectively repaired without any loss in structural strength and thus damaged planks may be rendered servicable again, even when subject to severe damage.

In the light of the above factors, a plank constructed as above described is highly suitable for use in scaffolding and can be produced at a significant cost dvantag in c mparis n with ther forms f pl nk, particul rly when the xpected useful lif of the plank of th pres nt inventi n is vastly superi r t that f wo den r metal planks.

The invention will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a section of scaffold plank;

Figure 2 is a perspective similar to Figure 1 of a second embodiment of the scaffold plank;

Figure 3 is a perspective view similar to Figure 1 of a third embodiment of the scaffold plank;

Figure 4 is a perspective view of a section of th stiffening member suitable for use in the scaffold plank as shown in Figure 3;

Figure 5 is a perspective view of a mould used t produce a scaffold plank as shown in Figure 1;

Figure 6 shows the mould of Figure 5 with support members, side and end pieces of the plank to be positioned in the mould;

Figure 7 shows the partly completed scaffold plank inverted to be relocated in the mould.

Referring now to Figure 1, the scaffold plank 10 is made of glass fibre reinforced thermosetting resin, commonly known as fibreglass. The plank comprises a top wall 12 and a bottom wall 14, which are spaced apart by a plurality of stiffening members, or ribs 20 opposite side walls 16 and end walls 18. The support members, and side and end walls are preformed as cured or substantially cured components of glass fibre reinforced resin and are assembled to, and made integral with, the top and bottom walls during the formation of the latter.

In the embodiment shown in Figure 1, the support memb rs 20 ar shown as being flat strips f rectangular cr ss section, and form longitudinally extending ribs j ined to the inner fac of the t p and bottom walls 12 and 14. The ribs 20 are spaced ap rt by a suitable distance, preferably equidistant, and pr f rably extend from ne nd to the th r f the plank. The ribs 20 are disp sed so as

to be generally ar right angles to the top wall 12 and bottom wall 14 and parallel to the side walls 16. The ribs 20 and side walls 16, are each bonded in the general region of their respective longitudinal edges, to the top wall 12 and bottom wall 14.

The end walls 18 may be connected to each end of the plank 10 and are so dimensioned that they cover the respective ends of the plank 10. Each end wall 18 is bonded to the top, bottom and side walls along the respective end edges. The end walls may be omitted from the plank, but are preferably provided to prevent foreign materials from entering the interior of the plank. The end walls also reduce the risk of damage to the end sections of the plank.

The plank 10 may conveniently be made in various lengths up to about 4.5 metres in length, and have a width of between 200mm and 300mm. The overall thickness of the plank 10 may conveniently be about 35mm to 50mm.

The ribs 20 and side walls 16 may each be about 5mm in thickness and the top wall 12 and bottom wall 14 may each be about 3mm to 5mm in thickness.

The above dimensions are given by way of example only, and these dimensions may be varied as required for any particular application and should not in any way be considered as being limiting to the invention.

As an alternative to ribs 20 in the form of a plurality of longitudinally extending upright members, as shown in Figure 1, different forms of ribs may be used. In Figure 2, there is shown a plank having a plurality of longitudinally extending inclined ribs 22 arranged at an angle to the top wall 12 and the bottom wall 14. The dir ction f inclinati n alternates between adjacent ribs 22, as sh wn. Alternativ ly, ach rib may b f "V" shaped cr ss-s cti n as sh wn at 23 in Figure 4, and placed adjacent n another. This w uld then pr duc a similar c nfigurati n t that shown in Figure 2.

As an alternative to stiffening members being in the form of individual longitudinally extending ribs 20 or 22 as shown in Figures 1 and 2, respectively, they may be of sheet form, as shown in Figure 3.

Figure 3 shown the stiffening member in the form of a longitudinally extending corrugated sheet 24 of saw tooth like cross-section. The alternate apices of the teeth are bonded to the top wall 12 and bottom wall 14, respectively, as shown. As an alternative to the corrugated sheet being of saw tooth cross-section, a sine wave or sinuous cross section may be used. The nodes and antinodes of such a wave form would be bonded to the top wall 12 and bottom wall 14 in a similar manner to that shown in Figure 3.

The side walls 16 may be formed integral with the adjacent rib 20 and such a side wall is shown in broken outline in Figure 4. Also the side wall may be integral with the opposite longitudinal edges of the corrugated sheet or strip.

The above described various forms of stiffening member are exemplary and other suitable forms are contemplated within the scope of the present invention.

A method of making the scaffold plank of the present invention will now be described with reference to Figures 5 and 6, using the plank 10 of Figure 1 as an illustrative example.

The mould 26 is of an open top rectangular box form having internal dimensions corresponding to the external finished size of the plank. The height of the mould may be somewhat less than the thickness of the plank to facilitate remov-l from the mould. Glass chop strand mat impregnated with polyest r resin is sprayed r pour d int r laid-up in the m uld 26 t form an uncured base layer 30 about 3mm t 5mm in thickness in the bott m f the mould 26. The glass chop strand mat may be f a density f 450 g/m^2.

The stiffening members in the form of a plurality of longitudinally extending ribs 20, together with the side walls 16 and end walls 18 are then placed into the mould 26 so the lower edge of each contacts the uncured layer 30 in the bottom of the mould.

The ribs, side and end walls, are pre-formed and are made from the same material that is located in the mould 26 to form the base layer 30 or a material that will bond thereto. Each of the ribs and wall sections are firmly pressed onto the uncured layer 30, to establish intimate contact therewith, and preferably to embed the edge of ribs and wall sections slightly into the uncured layer. The assembly so formed in the mould is then allowed to stand for a period sufficient for the resin to cure, at least to the extent that a secure bond is formed between the components. Once the resin has cured sufficiently, the resulting structure 34 is lifted from the mould 26. A layer of glass chop strand mat impregnated with polyester resin is again prepared in the base of the mould to form an uncured layer 32 of about 3mm to 5mm in thickness.

The structure 34 previously removed from the mould 26 is returned thereto, after being inverted, so that the plank wall formed from the previous layer 30 is uppermost as seen in Figure 6. The exposed edges of the ribs and walls of the structure 34 are thus brought into contact with the uncured layer 32 and preferably slightly embedded therein and the layer 32 is alowed to cure. This causes the layer 32 to bond with the ribs 20, side walls 16 and end walls 18, so as to be integral therewith. The layer 32 thus forms the other of the top and bottom walls 12 and 14 of the plank.

This th n complet s the structur f the plank 10, and it may b r mov d fr m the mould 26.

Th plank 10 may be sprayed with p ly ster resin. B f r this resin sets, a heavy c ating f sand, r ther suitable particulate material, is applied t the plank 10. The sand fuses with the p lyester r sin thus bec ming

integral therewith. This forms a non-slip outer surface on the plank 10 to improve safety in use. Any excess sand may be removed and used again.

As an alternative to removing the structural assembly 34 from the mould after the layer 30 has cured and then inverting the assembly and re-locating it in the mould, the following procedure may be followed. After stiffening members have been positioned on the layer 30 in the mould together with the side walls, the elongated cavities formed between the ribs 20 and/or the ribs and the side walls 16 are filled with a foam material, preferably a high density fibreglass foam. Where the ribs are of the flat vertical form as indicated in Figures 1 and 5, the fibreglass foam may be in the form of strips of appropriate dimensions to conveniently be received between the ribs or the ribs and side walls.

After the cavities have been filled with the fibreglass foam, a layer of chopped glass fibre mat is laid over the exposed upper face of the structure 34, and that glass fibre mat is impregnated with the resin. Alternatively, the mat may be impregnated with the resin prior to it being assembled in position on top of the structure 34. A mould cover is then placed over the top layer of impregnated glass fibre mat and weights applied to the cover so that the impregnated glass fibre mat will be pressed firmly against the upper edges of the rib 20 and side walls 16 to obtain a bond therebetween during subsequent curing of the top layer of resin impregnated glass fibre mat.

This alternative method of construction has the adv nt ge that the t p lay r f glass fibre mat and th impr gnati n ther f with the resin may be carried ut before the bott m layer 30 in th mould has cured. This r duces the total time that the mould is in use t produce a single c mpl t d scaff ld plank and consequently the production rat per mould is increased.

CLAIMS

1. A method of constructing a scaffold plank comprising:
(a) forming in a mould an elongated first layer of uncured resin impregnated glass fibre of a length and width corresponding to that of the finished plank,
(b) placing a preformed stiffening member or members in the mould extending substantially the length of the first layer and upstanding therefrom, the of each stiffening member being in intimate contact with the first layer at least at a plurality of spaced locations along the length thereof,
(c) forming an elongated second layer of uncured resin impregnated glass fibre of a length and width corresponding to that of the finished plank in intimate contact with the stiffening member or members at least at a plurality of spaced locations along the length thereof, said second layer being in opposed relation with respect to said stiffening member to the first layer, and
(d) allowing the resin in the first and second layers to cure to form the first and second layer and the stiffening member or members into an integral structure.

2. A method as claimed in claim 1, wherein two pre-formed side wall members are positioned in the mould between the forming of the first and the second layer therein, said side wall members being located to form, respectively, the opposite longitudinal sides of the finished plank, and ar in intimat c nt ct with the first and sec nd l y rs t be b nd d theret during the curing f th layers.

3. A method as claimed in claim 1 or 2, wherein the stiffening member or members is made of glass fibre reinforced resin and is located in the mould in a cured state.

4. A method according to claim 1, 2 or 3, wherein at least one of the stiffening members is of a "v" shaped cross-section and is positioned in the mould in an inverted dispostion with the ends of the arms of the "v" in intimate contact with the first layer.

5. A method as claimed in claim 2 or claims 3 or 4 when appended to claim 2, wherein each side wall is formed integral with an adjacent stiffening member.

6. A method as claimed in claim 1, 2 or 3, wherein one stiffenign member is used, being in the form of a corrugated sheet with the corrugation extending in the longitudinal direction of the plank, the crest of the corrugations on opposides of the sheet being in intimate contact with the first and second layers respectively during curings of the latter.

7. A method as claimed in claim 6 when appended to claim 2 or 3, wherein the side walls are integral with the respective opposite longitudinal edges of the corrugated sheet.

8. A method as claimed in any one of the preceeding claims, wher in the upwardly p n cavities, f rmed between th stiff ning members, are filled with a f am material, and th second layer of glass fibre is laid over said stiff ning members and f am, t be supported thereby during curing.

9. A scaffold plank constructed by the method as claimed in any one of claims 1 to 8.

10. A method of constructing a scaffold plank substantially as hereinbefore described with reference to the accompanying drawings.